

5.0 CONCLUSIONS

The survival and condition of hatchery-reared juvenile chinook salmon (100 to 170 mm, average 124 mm total length) in passage over spillbay 2 (without flow deflector) and spillbay 4 (equipped with a flow deflector) at Bonneville Dam were estimated using the HI-Z tag-recapture technique (balloon tags). These parameters were reliably estimated for only the direct effects of spillway passage at two spillbays each discharging about 12,000 cfs. Only one spillage rate was tested.

The primary criteria set forth by the ACOE, objectives, and assumptions of the research were met. A combination of high recapture probabilities (treatment fish >0.97 and control >0.96) and high control survival (>0.96) reduced the sample size requirements without sacrificing precision. With the observed recapture and control survival probabilities a paired release of 280 treatment and control fish each was sufficient to achieve a precision (ϵ) level of $<\pm 4\%$, 90% of the time. Additionally, the release of a single control group for two treatment groups reduced the number of fish needed for a comparable matched-paired release experiment.

The estimated 48 h fish survival probabilities of 1.0 in both experiments suggested that the spillbay configuration (with or without flow deflectors) at the hydraulic conditions tested had no effect on survival of juvenile chinook salmon. These survival probabilities are slightly higher than reported (0.98) in many other spill investigations.

Even though the estimated survival probabilities were the maximum possible, a small proportion of fish suffered injuries (1.3%), were descaled (0.5%) or lost equilibrium (0.5%). The most probable cause of injury and scale loss was attributed to contacts with hard surfaces of the spillbay and tainter gate. Primary injuries observed were hemorrhaging, bruises, and bulging eyes. Although the small sample size of injured fish precludes determining whether injury types are significantly different for the two test conditions, 4 of 271 fish recaptured from the non-flow deflector spillbay experiment had eye injuries while only 1 of 278 fish passed over the flow deflector showed an eye injury. Pressure or shear-related injuries were not readily apparent.

Additional smaller releases (100 fish each) of fish passed through ice and trash sluices at Powerhouses 1 and 2 provided the general condition of fish and identified some potential passage problems to emigrants. Injury rate was low (1.1%) at both sluices. A potential exists at Powerhouse 2 sluice for some fish to be diverted into a screened side channel and become "trapped". Fish using Powerhouse 1 sluice may be vulnerable to potential predation at the outfall area. However, this may need verification with detailed monitoring of the area.